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ABSTRACT

Using the book "Mindstorms--Children, Computers and Powerful Ideas" as a reference point, this paper deals with the sociological challenges raised by Seymour Papert and explores such issues as the role of computers as carriers of powerful ideas and the seeds of cultural change. Recent studies are cited indicating that although the computer has the potential to raise the educational aspirations of all students, a significant gap exists between rich and poor, urban and rural, and large and small school districts, as well as between male and female and Caucasian and minority groups. Suggestions are offered for developing constructive strategies for change. Twenty-two references are listed. (Author/LMM)

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# Teaching the Turtle--A Paper on Papert

## (Sociological Implications of Computer Education for Women and Minorities)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

A recent editorial ("Life or death," 1983) lists four ways of looking at the social effects of computers on humanity:

1. The social impact of computers is minimal to nonexistent.
2. Computers do affect the way we work and live, but there is no point in belaboring this, because there is nothing we can do about it anyway.
3. Computers are a powerful social force with unforeseen social consequences.
4. Computers are the salvation of mankind: they will narrow the gap between rich and poor and will make children smarter earlier.

Emphasis in this paper begins with the philosophy expressed in the fourth statement as presented by Seymour Papert in his book Mindstorms--Children, Computers, and Powerful Ideas. However, in describing his dream of the future Papert raises important issues such as: Which people will be attracted to the world of computers? What tastes will they impose? Will disadvantaged children, females, and the handicapped be denied the opportunity to become computer literate and remain unprepared to participate in the information revolution? Will the elite information processors be in a position to dominate the rest of society? Consideration of these issues forces us to look more closely at the third point of view and to focus on current aspects of computers in society, particularly as they affect women and minorities. Our intention then is to look first at Papert's philosophy, next at the social consequences of computer education, and finally at possible strategies for coping with the

problem, rejecting the first and second editorial statements as untrue.

Computers and Human Potential--Seymour Papert

Most educators are familiar with the name Seymour Papert--professor of education and mathematics at the Massachusetts Institute of Technology and developer of the computer language LOGO. In addition to working with computers and artificial intelligence, Papert displays a genuine concern for people, as evidenced by the philosophy presented in his book Mindstorms. Papert believes that the world is at a point in the history of education when radical change is possible--change that may revolutionize the way in which our culture as a whole thinks about knowledge and learning (1980, p. 39).

In the introduction to Mindstorms, in fact in the very first sentence of the book, Papert describes his childhood and how, even before the age of two, he was fascinated with automobiles and gears. These childhood gears served as models for Papert's later adult abstract thinking. Papert suggests that the computer can play a similar role in providing the conditions under which personal intellectual models can be developed for many children today (1980, viii).

Papert had the privilege of working for five years with the distinguished psychologist Jean Piaget. Most of us, when we think of Piaget, immediately recall his theory of the developmental stages of cognitive growth. We recite from memory how children develop through stages from the sensorimotor (from birth to about age 2), to preoperational (from 2 to 7), to concrete operations (from 7 to 11), and only then to more

complex, formal operations. Papert, however, presents a somewhat different interpretation. He chooses not to look at what children at certain ages can or cannot learn to do (Papert, 1980, p. 156). Instead, Papert places emphasis on the intellectual structures that could develop as opposed to those that actually at present do develop in the child (1980, p. 161). Papert is looking at human potential--at how the computer might be used to expand the human mind.

LOGO--A Problem Solving Approach

Through the computer language of LOGO, Papert has attempted to put the student in control. Instead of using the computer to program children, he helps students learn programming by empowering them with the ability to teach a turtle. The turtle is merely an abstract object on the computer screen or, in some cases, particularly with very young children, a computer-controlled toy, large enough to be handled and moved about the floor. By teaching the turtle new words, or commands, the child can direct the turtle's movements. The child also can begin to develop a structured system of thinking, problem solving, and decision-making.

Papert sees this method as particularly beneficial in teaching math. He believes that much math is currently being taught as a "dead" subject--as somewhat meaningless drill and practice of incoherent topics. (A recent NEA study, in fact, indicated that computers are used primarily for drill and practice exercises by 86% of the computer-using instructors (Karoff, 1983)). As a result, some students seem to "catch on"

and are labelled mathematical, while others are labelled verbal, or maybe some are labelled right hemisphere dominant and others left hemisphere dominant. Although Papert does not dismiss the idea of brain lateralization, he believes that we should seek out ways to reach all children. He disagrees with the idea that the appreciation of mathematical beauty and the experience of mathematical pleasure should be accessible only to a minority, perhaps a very small minority of the human race (Papert, 1980, p. 190). Papert's thesis is that

> significant change in patterns of intellectual development will come about through cultural change, and the most likely bearer of potentially relevant cultural change in the near future is the increasingly pervasive computer presence. (1980, p. 216)

Like Piaget he believes that all children should have the pleasure of learning to enjoy discovery and to come to respect themselves as individuals (Hilgard & Bower, 1975). He notes that for most people, nothing is more natural than that the most advanced ideas in mathematics should be inaccessible to children. But Papert wants to unleash mind power and present children with powerful ideas. He wants children to acquire a new image of themselves as mathematicians. He says:

> How we think about knowledge affects how we think about ourselves . . . . The discrepancy between our experience of ourselves and our idealizations of knowledge has an effect: it intimidates us, it lessens the sense of our competence, and it leads us into counterproductive strategies for learning and thinking. (Papert, 1980, p. 172)

Computers as a Powerful Social Force

Papert's statement about the intimidating effect of our attitudes toward knowledge brings us to a concern for the

sociological implications of computer education. We are all aware that the computer age is upon us. Approximately 175,000 computers are now in the public school system, and this figure is expected to double within a year (Pepper, 1983). Industry studies project up to 650,000 microcomputers by 1985 (Benderson, 1983). The computer has the potential of "becoming the great educational equalizer, cutting across class and socioeconomic lines to provide a solid basic education for all students" (Pepper, 1983, p. M-26). But recent studies paint a somewhat dimmer picture.

For example, a study in Florida (Dickerson & Pritchard, 1981) indicated that none of the districts in the smallest enrollment areas used computers for instruction, but all of the largest districts did. More recently a national study conducted by the Center for Social Organization of Schools at Johns Hopkins University (Becker, 1983) revealed that two-thirds of the public schools in the better-off districts have microcomputers while only 41 percent of the schools in the least wealthy districts have any. A gap exists between rich and poor, urban and rural, large and small school districts. In addition, the chairman of Howard University's board of trustees, Geraldine P. Woods, recently stated that black students have had less access to computers than white students (Magarrell, 1983, p. 9). And John P. Slaughter, the former director of the National Science Foundation, believes that unequal access to computers in elementary and secondary schools will continue to reinforce a shortage of blacks in science and engineering.

In the public schools where computers are available, not all students are taking advantage of the opportunity to learn. At one middle-class suburban high school, only four percent of the student body were enrolled in elective computer classes (Cole & Hannafin, 1983). A survey indicated that many students felt higher math was an essential prerequisite for any computer course. And many students, particularly female students, fear math. They are intimidated by their perception of math as a subject in which only intellectual males excel. Female students in the survey perceived their math competency to learn computer skills significantly lower than males. Although a large percentage of students perceived knowledge of computers as important to their future careers, few indicated any plans for enrolling in computer courses. As computer technology develops into a prestigious profession it may become dominated by a technical elite, placing those less well prepared in a subservient role. Papert points out that negative self-images are extremely robust and powerfully self-reinforcing. Those who do not seek advanced training opportunities may become the "technopeasants" of the future.

A similar situation exists in the booming popularity of summer computer camps. Enrollment in these programs is overwhelmingly male Caucasian middle to upper class with a ratio of boys to girls of roughly three to one (Hess & Miura, 1983). Traditionally parents seem more willing to invest in this type of training for their sons than for their daughters (Van Nuys, 1983). Some observers fear that current trends will lead to a society in which high income students will instruct computers and

low income students will be instructed by computers. Hess and Miura conclude that "the new technologies may threaten gains in educational and career opportunities for women and minorities that have been achieved at great effort in the past two decades" (Hess & Miura, 1983, p. 54).

One of the newest developments in the computer industry is computer games for girls. Apparently aware that females are less intrigued by monsters, snakes, and violence, the Rhiannon Company in Richmond, VA has produced a new series of games with titles such as Jenny of the Prairie, Chelsea of the South Sea Islands, and Cave Girl Clair. We can assume from the advertisements that while girls are helping Cave Girl Clair gather food and medicinal plants in the traditional manner, boys will be playing games like Custer's Revenge or will be enjoying endless hours of "fun and surprises from Sheila," a scantily attired female who is chained to the tower wall. While on the topic of advertising, it has been noted that some of the most blatant sexual-stereotyping appears in computer hardware and software ads. When confronted with a particularly odious example of stereotyped advertising for adult computer games, one company representative replied, "Ninety percent of our users are white, college educated males, so we're catering to our audience" (Tinker, 1982, p. 210).

Meanwhile, according to a recent article in Newsweek, wealthier families are not waiting for school to begin but are enrolling their infants in projects such as "Small Bytes for Little Tykes" at costs of nearly $2000 a year per child ("Bringing Up Superbaby," 1983). Others economize by purchasing

Micro Mother Goose, which includes a bonus of six colorful Mother Goose stickers.

Parents in some of the poorer communities are becoming resentful, because they feel that the ghetto child is unduly deprived and that the continuing push for computer literacy will only widen the split in already strained divisions between social and economic classes (Puetz, 1983, p. 44). In Connecticut, parents are concerned that students with home computers will have a significant academic edge over those who cannot afford them ("Technology News," 1983). And sales records indicate that home computers are being purchased by males for males. For a variety of reasons the Computer Age appears to be dominated by white males.

## Strategies for Change

Despite the problems presented, progress is being made. Computers are being placed in more and more schools. Apple Computer, Inc. plans to give away 9,000 Apple IIe's and accompanying LOGO software to schools in California. Project SEED, based in Berkeley, is cited as one example of an outstanding program for teaching mathematics to ghetto children (Patterson, 1983). Stanford University is offering special computer programs for minority high school students (Mace, 1983, August 8). In Massachusetts a $500,000 statewide program is providing Computer Literacy Summer Programs for students selected from CETA's youth employment programs. Texas is offering in-school training for parents of poverty level pupils as well as

the loan of a home computer for their children's use (Mace, 1983, August 1). Teachers are being trained to use computers more effectively. More emphasis is being placed on developing problem-solving skills, not just in the wealthier schools but in the intercity and rural areas as well. Perhaps we are no longer as Bonham says merely "decorating obsolete processes with new technologies" (1983, p. 57).

Topics other than death and destruction are being introduced in the newer computer games. Production of some of the more obnoxious adult games has been halted. Educators are becoming more cautious in their selection of software for the classroom.

Progress is even being made in improving attitudes of high-school girls toward math and in changing their self-concepts. A program at Mount Holyoke College called Summer Math uses computers to help young women overcome the helplessness they have felt in the face of abstract concepts ("Curing Math Anxiety," 1983). The promises of Papert may be coming true.

Nevertheless, we are reminded that "in the post industrial age the difference between the haves and have-nots will be measured in terms of technological literacy" (Hersh, 1983, p. 637). As John Naisbitt (1982) writes in Megatrends, "In the information society, the two required languages will be English and computer" (p. 34). "The more computers there are and the more people who understand and have access to them, the less chance there is that some technocratic elite will use them to exploit everyone else" (Miller, 1983, p. 18). If the computer is to revolutionize the learning experience and produce the educational Utopia that Papert envisions, then we as women and

minorities must not be intimidated--we must heighten the sense of our own competence and pursue constructive strategies for increased knowledge for ourselves and for our children. Viable strategies might include enrolling in microcomputer courses, attending computer workshops, reading computer journals, buying home computers for our daughters, participating in curriculum committees, or raising funds for the PTA to purchase additional hardware and software for our schools. Clearly, the social impact of computers is too great for us to sit idly by with a "there's nothing we can do about it anyway" attitude.

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